

NATIONAL BUREAU OF STANDARDS REPORT

3607

OPERATING INSTRUCTIONS FOR THERMOSCREEN, NAX-1-52

by

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Report to

Bureau of Aeronautics
Department of the Navy
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U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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DESCRIPTION OF THE THERMOSCREEN

The Model NAX-1-52 thermoscreen is a mechanically-ventilated enclosure for weather instruments designed particularly for installation on shipboard within a deck house or other structure such that weather data can be obtained by an observer protected from the weather. This model can also be mounted out-of-doors or used at shore stations if desired. It accommodates a recording hygrothermograph, maximum and minimum thermometers of the dial type and mercury-in-glass wet and dry bulb thermometers. For indoor installation, the thermoscreen must be mounted on or close to an outside wall since weather air must be drawn in for sampling through a tube of limited length. For test purposes, the prototype specimens were designed to be mounted on plates set in portholes so that piercing the walls of deck houses could be avoided. Plates so used would be pierced to accommodate the sampling tubes. Regular practice may be to pierce special holes so that the thermoscreen can be located for the convenience of weather officers.

The unit is completely self-contained with the instruments mounted in an insulated, double-walled enclosure, as shown in Fig. 1. Outdoor air is drawn through a center inlet tube, shown on the right in Fig. 2, passed over the instruments at a moderately high velocity, and then exhausted through a second tube mounted coaxially with the inlet tube. Thus the exhaust tube shields a part of the inlet tube from solar radiation and the exhaust air removes some of the solar energy absorbed at the surface of the unshielded portion of the inlet tube. The inlet tube is made long enough to extend well beyond the layer of air that would be warmed or cooled by contact with the side of the house.

A conical baffle on the inlet serves to deflect the warmer air discharged from the unit thus preventing recirculation and it also shades a part of the inlet tube from the sun. The temperatures indicated by the instruments will be within $\pm 1^{\circ}$ F of the true air temperature for most outdoor weather conditions encountered in shipboard installations.

In Fig. 1, A is the hygrothermograph, B is the wet and dry bulb thermometer assembly, C are the maximum and minimum dial thermometers, D is the blower for circulating air through the unit, E is the water reservoir for the wet bulb thermometer, and F is the fuse box and junction box for the blower motor.

INSTALLATION

It is proposed that the unit be mounted in a porthole opening such that the observation and recording of data could be conveniently carried out inside the ship. Figs. 2 and 3 show a simple mounting designed to withstand the vibration and shock encountered in a shipboard installation. The thermoscreen unit is supported primarily by a length of 3-inch pipe. This pipe is screwed into a flange which is in turn fastened to a flat metal plate designed to fit the porthole opening. This plate is supported by the fastenings found in the existing porthole. It may be necessary to solder a metal bar at the top of the unit to provide a base for the shock mounts.

An alternate mounting with greater shock resistance is shown in Fig. 4. The length of 3-in. pipe is replaced by a flexible 3-in. tube and a supporting shelf is used. Shock mounts are placed at the indicated locations.

The air intake tubes are inserted at the rear of the unit and secured with a twisting motion. The lengths of the tubes which extend from the back of the instrument may be modified for purposes of installation. The distance between the side of the ship and the nearer edge of the conical baffle on the inlet tube should be 4 in. A source of 115 Volt cycle A. C. power is required for the blower.

OPERATION

Place distilled water in the reservoir located beneath the unit for the wet bulb thermometer.

The hygrothermograph is a stock item of the manufacturer so instruction book No. 201 of the manufacturer is applicable. This instruction book is identified as Part No. 509709 and is dated Nov. 1949. Note that a choice of a 10-hour or 30-hour recording period is possible. After the hygrothermograph has been put in operation, place it within the thermoscreen and fasten it securely with the wing nut on top of the instrument frame. Adjust the readings of the hygrothermograph to correspond to those obtained on the wet and dry bulb mercury thermometers, after a period of two hours has elapsed during which the instrument attained steady readings.

Fasten the outside door.

Connect power and turn switch on.

All instruments are designed for continuous readings. If long periods of time elapse between wet bulb readings, a length of plastic tubing should be placed over the wicking which covers the wet bulb thermometer. This can be done by removing the water reservoir. Such a covering on the wick will keep it clean for a much longer period.

Turn the friction pointer indicator on one dial type thermometer in a clockwise direction until it barely contacts the temperature-indicating pointer so it will indicate the minimum temperature reached during a selected period.

Turn the friction pointer indicator on the second dial type thermometer in a counter-clockwise direction until it barely contacts the temperature-indicating pointer so that it will indicate the maximum reached during a selected period.

MAINTENANCE

A few drops of Gulf Electric Motor Oil or its equivalent should be placed in the lubrication cups of the electric motor every six months. If an equivalent oil is not readily available, standard SAE number 20 could be used.

Periodically check the hygrothermograph following the recommendations of the manufacturer in instruction book No. 201.

When the wicking on the wet bulb thermometer becomes stained, dirty, or covered with precipitates, it should be replaced with a length of clean wicking.

REPAIR AND REPLACEMENT

All components are readily replaceable

Motor

- (1) Turn motor switch off.
- (2) Disconnect power lead.
- (3) Remove 10 sheet metals screws in the 7" x 11" vertical panel on the right side of the unit housing.
- (4) Separate plate from main body of the thermoscreen at the gasket junction.
- (5) Remove three screws which hold blower to the plate.
- (6) Install new blower in reverse order being careful to make an airtight seal between blower motor and plate and between plate and main unit using gasket material and rubber cement.

Fuse, lamp 250 volt 3AG (in junction box).

Pilot Light, 3 Watt 120 volt S-6 Screw Base (in junction box).

Maximum and Minimum Thermometers

- (1) Fasten compressor ring tool on rim of thermometer.
- (2) Turn counter-clockwise and remove unit.
- (3) Install new unit in reverse order.

Wet and Dry Bulb Thermometer

- (1) Open side access door.
- (2) Loosen wing nut on top of hygrothermograph frame.
- (3) Remove hygrothermograph.
- (4) Remove 2 retaining nuts on hygrothermograph mounting near access door at bakelite panel level.

Maximum and Minimum Thermometers (Continued)

- (5) Remove entire mounting frame.
- (6) Remove screw which supports cap on thermometer tube.
- (7) Unscrew cap.
- (8) Remove glass thermometer from supporting tube.
- (9) Install new thermometer in reverse order.

Observation Window

- (1) Remove the 16 retaining screws which hold metal frame.
- (2) Remove window frame.
- (3) Remove window.
- (4) Install new window in reverse order.

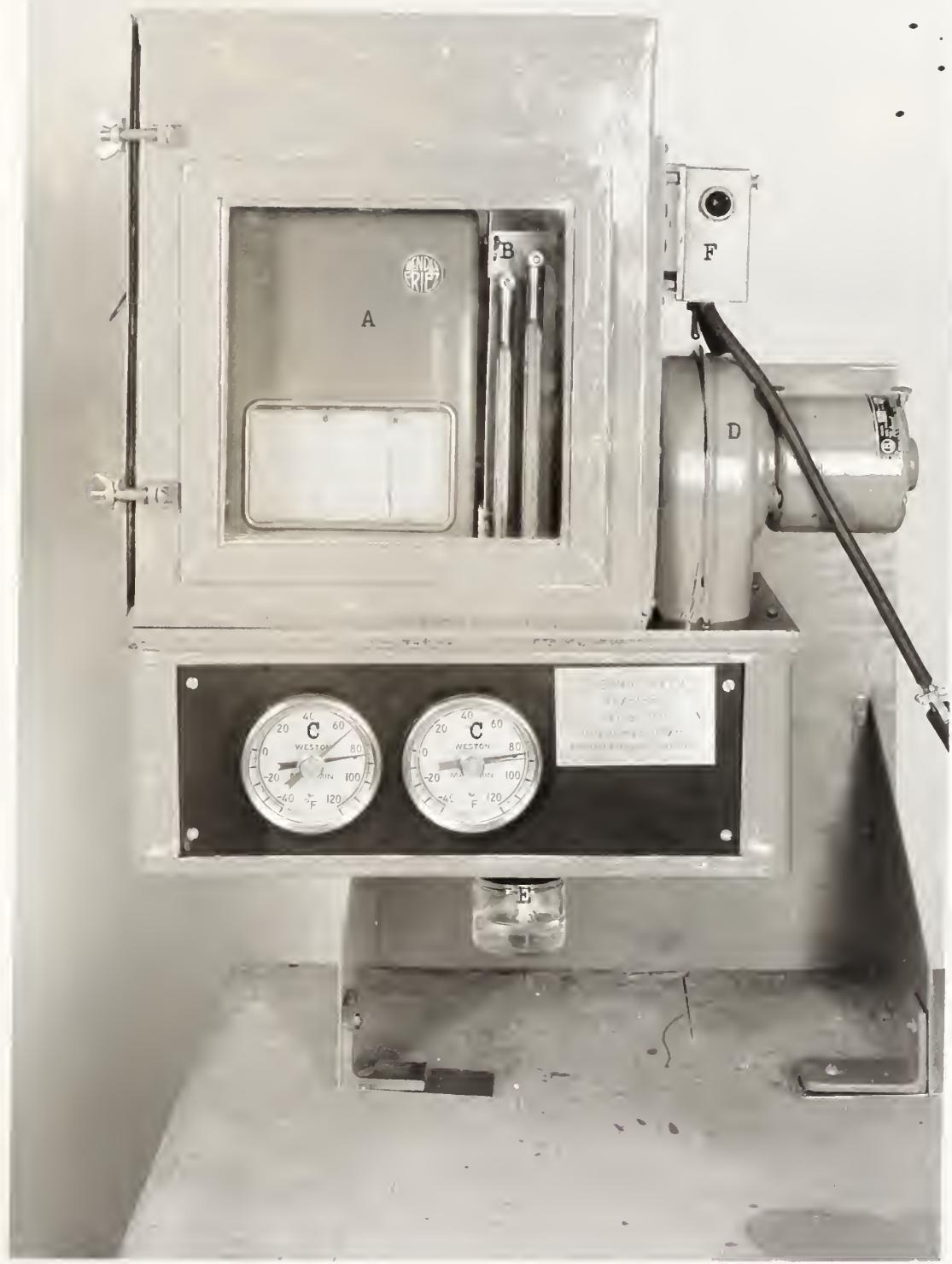


Fig. 1

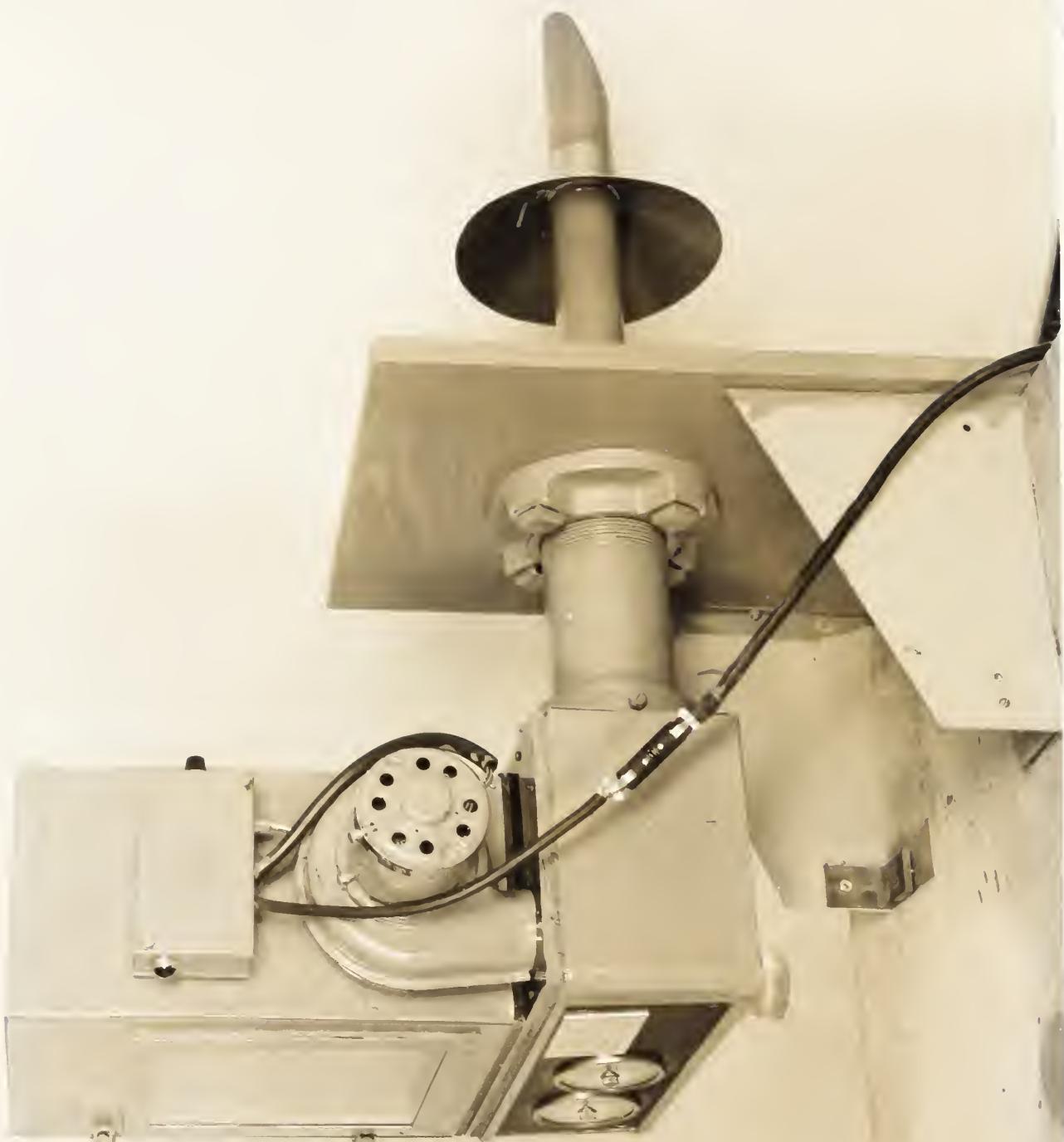


Fig. 2

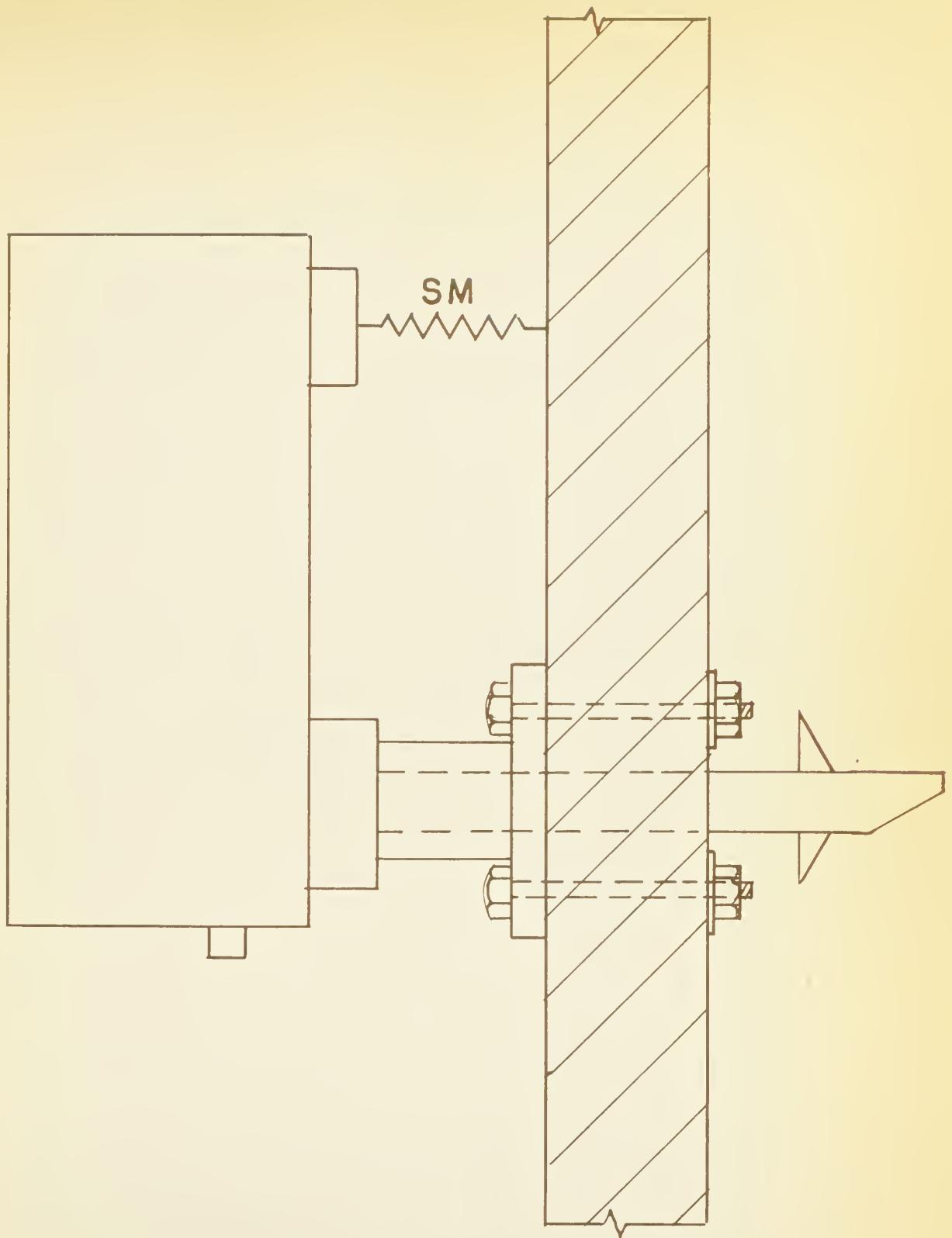
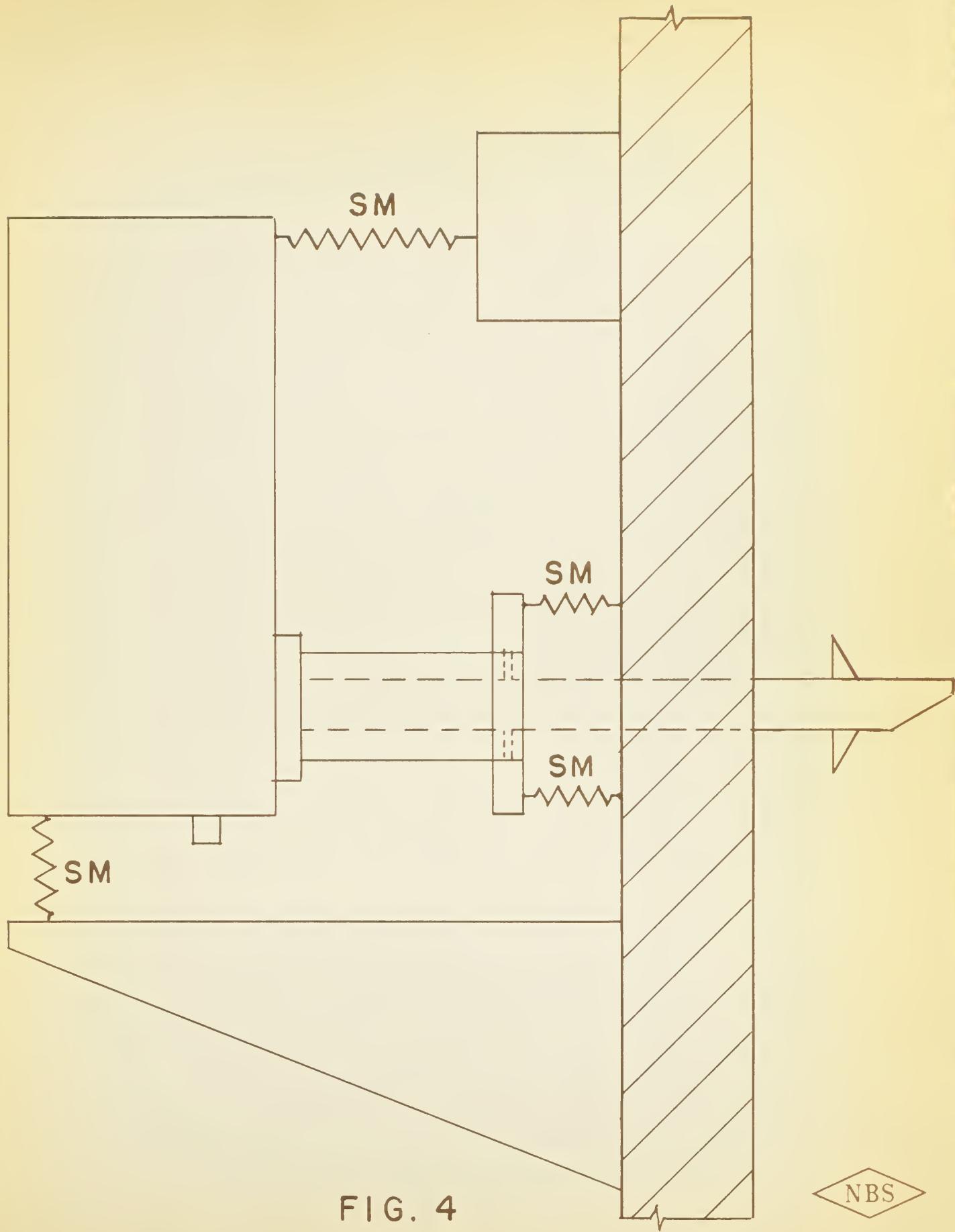


FIG. 3

NBS



THE NATIONAL BUREAU OF STANDARDS

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The functions of the National Bureau of Standards are set forth in the Act of Congress, March 3, 1901, as amended by Congress in Public Law 619, 1950. These include the development and maintenance of the national standards of measurement and the provision of means and methods for making measurements consistent with these standards; the determination of physical constants and properties of materials; the development of methods and instruments for testing materials, devices, and structures; advisory services to Government Agencies on scientific and technical problems; invention and development of devices to serve special needs of the Government; and the development of standard practices, codes, and specifications. The work includes basic and applied research, development, engineering, instrumentation, testing, evaluation, calibration services, and various consultation and information services. A major portion of the Bureau's work is performed for other Government Agencies, particularly the Department of Defense and the Atomic Energy Commission. The scope of activities is suggested by the listing of divisions and sections on the inside of the front cover.

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The results of the Bureau's work take the form of either actual equipment and devices or published papers and reports. Reports are issued to the sponsoring agency of a particular project or program. Published papers appear either in the Bureau's own series of publications or in the journals of professional and scientific societies. The Bureau itself publishes three monthly periodicals, available from the Government Printing Office: The Journal of Research, which presents complete papers reporting technical investigations; the Technical News Bulletin, which presents summary and preliminary reports on work in progress; and Basic Radio Propagation Predictions, which provides data for determining the best frequencies to use for radio communications throughout the world. There are also five series of nonperiodical publications: The Applied Mathematics Series, Circulars, Handbooks, Building Materials and Structures Reports, and Miscellaneous Publications.

Information on the Bureau's publications can be found in NBS Circular 460, Publications of the National Bureau of Standards (\$1.00). Information on calibration services and fees can be found in NBS Circular 483, Testing by the National Bureau of Standards (25 cents). Both are available from the Government Printing Office. Inquiries regarding the Bureau's reports and publications should be addressed to the Office of Scientific Publications, National Bureau of Standards, Washington 25, D. C.

